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The demand for school meals: an analysis of stated choices by Swiss households

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Abstract

In this paper we investigate households' demand for school meals using a stated preferences approach. Data are collected through phone-structured interviews to 905 residents with children in the German-speaking region of Switzerland during 2007. A Poisson model with random effects is used to explore factors affecting the demand for meals at school. The results show that meals price, household income, satisfaction with the current childcare service, family composition, and the area of residence significantly affect the number of school meals demanded. We estimate that the willingness to pay for a school meal is about 11.60 Swiss francs and does not depend on household income.

Keywords: Demand, school meals service, panel count data, Poisson regression, random effects, willingness to pay.

JEL classification: D12; H31; H42; J13

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1 Introduction

In most OECD countries, parents face considerable challenges when trying to reconcile their family and work commitments, since all-day childcare facilities are not always available (OECD 2007). Parents who decide to work full-time or part-time may pay a substantial amount for private childcare services. Other parents prefer to stay out of the job market and provide full-time care directly to their children. Problems with the organization of childcare before and after school hours and during lunchtime are substantial, particularly for families with children at primary school. Consequently, supervised school meals service and extracurricular activities may improve household's choices and are probably beneficial to those parents who give value to opportunities at work.

The collection and the analysis of information on households' preferences and the willingness to pay for meal services may represent an important step towards policies aiming at improving reconciliation between family and work life. In Switzerland, municipalities are mainly responsible for the decision to offer supervised school meal services. Since cantonal authorities usually play a secondary role in this decision process, the supply of school meal services is rather heterogeneous across and within cantons.[1] In several cantons, most of the municipalities do not supply supervised school meal services but many of them have recently discussed the possibility to increase the supply. Conversely, those municipalities already providing school meal services usually set a relatively low price, which is unsatisfactory because it does not cover the average cost of the service. Indeed, this pricing policy has led to financial problems. Consequently, municipalities that are interested in pro-

[1] Switzerland is a federal State with a largely decentralized education system. Primary school education is mandatory and generally supplied by the State. The tasks of the education system are shared between three levels of government - the Confederation, the cantons and the municipalities - which work together in their respective areas of responsibility to ensure high quality in education. The organization and the regulation of the education system is not homogeneous across the territory, since each of the 26 cantons has its own subsystem of primary schools. The cantons and their municipalities are responsible for the organization and financing of primary schools. In particular, municipalities assume competences on pre-school, primary and lower secondary levels.

viding school meal services are also interested in learning more about the willingness to pay of households.

In this paper, we investigate the demand for school meals for children attending primary schools in Swiss cantons characterized by a lack of supply of supervised school meal services. We consider four cantons which are representative of the northwest part of Switzerland. These cantons and their municipalities are about improving the supply of childcare services at primary school, by introducing a meal service available between the end of the morning classes and the beginning of the afternoon classes. Using a stated preferences approach, we analyse the hypothetical weekly demand of school meals, conditional on household's and service characteristics. First, we collect data on the weekly demand of school meals by 905 households. We then apply count data models to study factors affecting household's preferences. Finally, we assess the willingness to pay for the new service and discuss improvements in the pricing policy for an efficient provision of school meal services.

The literature lacks empirical studies on the demand for school meals. Two studies vaguely relate to our analysis, although their focus is on the demand for different types of diet rather than the demand for meals. Lee (1987) investigates the demand for varied diet in US households between 1977 and 1978. Count data approaches, such as the Poisson model and the negative binomial model, are used to examine the impact of household characteristics on the number of different food items consumed during a week. The results show that an increase in food expenditure increases the number of food items consumed at home. Moreover, the number of food items consumed at home is positively related to the number of household members. Akin *et al.* (1983) analyse participation in the US National School Lunch Program by 1222 children. Following the traditional utility theory, the authors write the demand for school meals as a function of the price of meals, the price of complements and substitutes, the budget constraint and several socioeconomic characteristics. A vector of nutrient taste variables is added to the demand function. The demand is estimated by means of

ordered probit models where the dependent variable is the quantity of school meals. Based on the estimates, a 50 percent increase in the full price of school lunches for students is expected to reduce the participation in the National Program by 20 percent. The authors affirm that taste variables are important in assessing the demand for school meals.

Through this paper, we provide a first empirical analysis of the demand for meal services at primary school in Switzerland. Our analysis allows to disentangle factors affecting household's choices and to calculate the willingness to pay for school meals. We believe this represents an original contribution to the modest economic literature on the demand for school services.

The remainder of the article is structured as follows. In Section 2, we specify a model of the demand for school meals. Section 3 is devoted to the survey design and data description. In Section 4 and Section 5, we present the estimation results of our model and calculate the willingness to pay for school meals by Swiss households respectively. Concluding remarks and policy considerations are discussed in Section 6.

2 Model specification

Family decisions regarding the demand for school meal services depend upon several factors, primarily job opportunities and constraints, and preferences for family life. The analysis of the relationship between household choices in the labour market and the demand for school services is beyond the scope of this paper. Instead, we focus on the demand for school meals consequently to household decisions in the labour market, and try to disentangle how different family characteristics are related to this demand. Hence, we hypothesize that the household demand for school meal services is generated by the following function:

$$Q = f(z), \tag{1}$$

where Q is the hypothetical number of school meals per week and z is a vector of k socioeconomic variables, including household income, and meals price.

To specify an econometric model, it is worth noticing that the dependent variable in the above equation (1) is a count variable that indicates the number of times parents buy a school meal for their children within a week. Linear regression models are not suitable for count outcomes since the estimation results can be inefficient and biased. Models that specifically account for the generation process of the data are more suitable for count outcomes. In the literature, we find two main econometric approaches: the Poisson regression and the negative binomial regression. Some authors (Akin *et al.* 1983) also use ordered logit or probit models. However, the econometric literature (Greene, 2003; Cameron and Trivedi, 2005) advises count models as the most appropriate. Finally, count models offer the advantage that the calculation of consumer surplus is relatively simple. Several studies apply count models to explore, for instance, the demand for hospitalizations, the number of beverages, the number of visits to a national park, or the number of patents. Cameron and Trivedi (1986) analyse factors affecting the frequency of doctors' consultations, Mullahy (1986) explores factors that influence the number of beverages, and Carpio et al. (2008) investigate the demand for agritourism in the United States.

To estimate the demand model, we first consider a Poisson regression. Unobserved heterogeneity that remains constant over time is taken into account by means of a random-effects version of the Poisson panel regression.[2] Our model includes several time-invariant covariates. Consequently, the fixed-effects version of the count model is neglected. For comparison purposes with the Poisson regression, we also estimate the demand model using a negative binomial regression. The possibility of applying a two-part model and a zero-inflated count model has also been discussed. However, due to the fact that the zeros and the positive values in our sample come from the same generation process, these two econometric approaches are not advisable (Cameron and Trivedi 2005).

To focus on the Poisson model, we recall that the Poisson probability

[2]See Hausman *et al.* (1984), Cameron and Trivedi (1998), Greene (2003) and Baltagi (2008) for details on Poisson regressions for panel data.

density function can be written as:

$$P(Q = q) = \frac{e^{-\lambda}\lambda^{q}}{q!}, \tag{2}$$

where $q = 0, 1, 2, ...$ is a random variable indicating the number of times an event occurs, and λ is the parameter of the Poisson distribution. Precisely, λ is the expected number of times an event occurs within a given time. This is a one-parameter distribution with both the mean and the variance of Q equal to λ.

In our case, the Poisson distribution defined by (2) assumes that all families have the same expected demand in terms of the number of school meals. Since this assumption may not be very realistic, we can allow for heterogeneity in λ by using the following Poisson regression model:

$$\lambda_i = \exp(z_i\beta), \tag{3}$$

where λ_i is a function of vector of socioeconomic characteristics of the household and price for the service (z_{ik}). The subscript i indicates the household and β are parameters. Taking the exponential of $z_i\beta$ forces the expected count λ to be positive, which is required by the Poisson distribution.

Socioeconomic control variables (z_k) provide information on the price for a meal (*Price*), the household monthly income (*Income*), the structure of the family in terms of number of members and their age, the level of education, work contraints and the area of residence of the households, and satisfaction with the current childcare mode. More precisely, we include a dummy variable (*Care by others*) to capture whether the child is cared by non-family members, a dummy (*Urban*) for the area of residence (urban vs. countryside), and dummies for cantons of residence (*AG*, *BL*, *BS*, *SO*). We also include a dummy (*Mother*) to indicate if the respondent is the child's mother, the age of the respondent (*Age*), whether or not the respondent is a foreigner (*Nationality*), the percentage of work of the respondent (*Work*), and whether or not the respondent has a university degree (*University*). In addition, we consider household satisfaction with the current care mode (*Satisfaction*) and the age of the child (*Child age*). If the family has more

than one child, the number of additional children is measured by covariates for different age categories (*below 3 years of age*, *between 3 and 5*, *between 6 and 10*, and *between 11 and 15*). A dummy (*Adults*) indicates whether there are more than two adults in the household, i.e. people older than 15. Finally, we consider whether or not both parents live in the household (*Parents*). Socioeconomic variables are listed and described in Table 1.

[Table 1]

Given equations (2) and (3) and the assumption that the events are independent, it is straightforward to estimate our Poisson regression parameters (β) by means of a maximum likelihood procedure. The log-likelihood function for the Poisson regression model is given by:

$$L(\beta) = \sum_{i=1}^{N} \left[q_i(z_i\beta) - \exp(z_i\beta) - \ln q_i! \right]. \tag{4}$$

where N is the number of observed values q_i in the sample.

In our model specification, the parameter estimates (β) indicate the impacts of the kth-independent variable on the number of school meals demanded. The signs of the estimated parameters indicate the direction of the impacts. These parameter estimates can be used in several ways.[3] In this study, we mainly use the results to compute the percentage change in the expected count for a δ-unit change in one of the explanatory variables, for instance a socioeconomic characteristic of the household (z_k), holding all the other variables constant. This can be computed as:

$$\frac{\Delta\lambda}{\lambda} = 100 \times \left[\exp(\beta_k \times \delta) - 1 \right]. \tag{5}$$

Consequently, we will discuss the impact of changes in the socioeconomic characteristics of households in terms of percentage change in the number of school meals households are willing to purchase.

[3] See Long and Freese (2003) for a discussion on this issue.

3 Survey design and data

To investigate the demand for school meals, we adopt a stated preferences approach, i.e. we collect data from a hypothetical market. This approach is driven by the limited number of municipalities currently offering supervised school meals within the country. Since families living in the cantons considered in our analysis do not have the possibility to purchase supervised school meal services, their demand is not revealed.

Data were collected through phone-structured interviews administered to households with children at primary schools and living in one of the four cantons of the northwest part of Switzerland, a German-speaking region. The survey was conducted during November 2007 and a specific software helped to input the answers. The average length of an interview was about 17 minutes. The dataset obtained for the analysis in this paper is part of a project commissioned to the Institute of Economics at the University of Lugano and financed by four Swiss cantons (Aargau, Basel-City, Basel-Land and Solothurn).

The questionnaire is made of two parts. In the first part, we asked information on the demand for supervised school meal services. In the second part, we collected information on the socioeconomic characteristics of the households. Also, we collected information on the use of alternative childcare services when parents are unable to directly provide care to their children. At the beginning of the interview, the characteristics of a typical supervised school meals service were presented to the household.[4]

During 2007-2008, primary schools in our region were attended by 63155 pupils, 32150 of which were boys (50.9%) and 31005 girls (49.1%). Foreign pupils represented 24.7% of the children population. There were 3166 classes in total, each of them with 20 children on average. Families received a letter with a coupon to explain the characteristics of the study and to ask for

[4]The school meals service starts at the end of the morning classes and ends at the beginning of the afternoon classes. During this period, children have their lunch, the opportunity to play, to rest or to do homework. The staff is trained to take care of children. The meal service is delivered within the school or in another building/facility nearby.

participation. Around 60% of the respondent households (3645) agreed to answer the questionnaire in the form of a phone interview. However, because of budget limitation, only 905 families were randomly selected for the interview. The final sample is representative of the households population in each of the four cantons.

[Table 2]

Some descriptive statistics for the households sample are provided in Table 2. Households characteristics are grouped in two main categories: socioeconomic characteristics of households, and children's characteristics and family composition. Note that the number of observations varies with households characteristics since not all interviewed households answered all the questions.

Concerning socioeconomic characteristics, households are first classified according to three monthly income classes: low, medium, and high. 32% of the sample (280 families) indicate a level of income below 6001 Swiss francs per month. 36% of families (320 households) gain between 6001 and 8000 Swiss francs per month. Finally, 32% of families (282 households) gain more than 8000 Swiss francs per month. Regarding the other socioeconomic characteristics, 83% of households live in urban areas and only 17% in rural areas. Households are equally distributed across the four cantons (25% in each canton). Mothers are responsible for the care of children in about 91% of the cases, while fathers only in 9%. For this reason, the average level of employment of the respondent is relatively low (38%). The average age of the respondent is 40 years. The respondents are Swiss in 83% of cases and have a university degree in about 13% of cases. As many as 47% of children are cared during lunchtime by people other than the parents, for instance relatives or neighbours. Only in 51% of the cases, parents are satisfied with the current childcare mode.

Variables related to the family composition and children's characteristics include the number of children and adults in the household as well as the age of the children. The average children age is about 9 years old. On average,

households include 0.1 additional children younger than 3, and 0.33 additional children between 3 and 5. On average, families have one additional child between 6 and 10 years old, and 0.47 additional children between 11 and 15 years old. In about 90% of households, there are more than two adults (older than 15), and in 84% of households both parents live together.

To collect information on the demand for school meals, households were asked to consider up to five levels of price for the meal service and to state the maximum number of meals they would buy at each level of price. The other characteristics of the service, for instance the number of children per staff member or the opening hours of the service, were not changed. The initial level of price was set according to household's monthly income. Respondents were asked to consider their employment status as unchanged when answering the questions. Three initial levels of price were proposed to respondents: 2.50 Swiss francs for low-income families, 7.50 Swiss francs for medium-income families, and 12.50 Swiss francs for high-income families. The initial price was then increased by 2.50 Swiss francs, repeatedly, for each income group. The experiment stopped as soon as the respondent declared he/she was unwilling to buy any meal at the proposed level of price. Clearly, the maximum number of meals a household could buy was equal to five, i.e. the number of days the meal service could be available within a week. Since some of the interviewed households were not interested in the school meal service, they were not asked questions regarding the willingness to buy school meals according to different levels of price. Among the 905 households only 679 provided information on the demand for school meals.

[Table 3]

Frequencies of school meals demanded at different levels of price for low-income, medium-income, and high-income households, are reported in Table 3. A total of 269 households (39.62%) declared they were not willing to purchase school meals at the proposed initial price. This implies that around 60% of households were willing to buy at least one school meal at the lowest proposed price. Generally, we observe that for a given level of quantity, the

number of households willing to buy decreases with an increase of income, which is in accordance with the law of demand for normal goods. Moreover, the number of households demanding a certain quantity of meals decreases when the price increases, *ceteris paribus*. On average, a low-income family would be willing to buy 1.56 lunches during a week at the lowest proposed level of price (2.5 Swiss francs); a medium-income family would be willing to buy about 1.28 lunches; and a high-income family would purchase 1.31 lunches. The average price that households are willing to pay for a school meal is reported in Table 2 and corresponds to about 9.92 Swiss francs.

4 Estimation results

Count data models help us to identify the most important factors that influence the number of school meals demanded by households during the week. We can now present the results from the estimation of count models used to analyse the hypothetical demand for school meals: a Poisson regression, a negative binomial regression, and a Poisson regression with random effects (see Table 4). The results of a pooled Poisson regression and a pooled negative binomial regression are reported together for the purpose of comparison. These results are similar. The use of a negative binomial regression instead of a Poisson regression is indicated in presence of significant overdispersion, i.e. when the variance exceeds the mean. We performed a formal test on the null hypothesis of equidispersion.[5] The coefficient of our test is 0.089 and is highly significant, which suggests that equidispersion cannot be rejected. Consequently, the Poisson regression represents an appropriate approach. However, to take into account the unobserved heterogeneity that remains constant over time, we further estimate a random-effects version of the Poisson panel regression and report the results in the last column of Table 4. Since we considered different initial levels of price according to household income, we also run Poisson regressions where we interact the price variable with the income variable. The goal of this model specification is to analyse

[5] See Cameron and Trivedi (2005) for details.

whether the willingness to pay for a school meal depends upon income. The estimation results are reported in Table 6 and will be discussed later in Section 5 to assess the willingness to pay for school meals. We also estimated models separately for each income class. These estimations are not reported in the table since the main results are unchanged.

[Table 4]

To briefly compare the Poisson regression and the negative binomial regressions along with the Poisson regression with random effects, note that the signs of all the coefficients are the same. Differences are observed as with respect to the level of significance. Generally, the coefficients of the Poisson with random effects are less significant than the Poisson regression and the negative binomial regression. In particular, the area of residence, the nationality, the percentage of work, the level of education, and the number of additional children between 3 and 5 years old are not significant anymore in the Poisson model with random effects.

To discuss the sign and the level of significance of the estimated parameters in more details, we can start with the price of school meals. As expected, the coefficient of price is negative and highly significant. Higher levels of price would clearly decrease the number of school meals demanded by households.

Focusing on children's characteristics and family composition, we observe that three covariates are highly significant: the number of children between 6 and 10 years old, the number of children between 11 and 15, and the presence of both parents in the household (only in the Poisson and the negative binomial regressions). The impact of these covariates on the number of school meals demanded is negative. Hence, the presence of additional children and the presence of both parents decrease the number of school meals demanded. This could be explained by the fact that parents with more children are more likely to look after their children directly and prepare meals at home. Also, the number of additional children younger than 3 and the number of additional children between 3 and 5 reduce the number of

school meals demanded. However, the former variable is never significant, and the latter variable is highly significant in the Poisson and the negative binomial regressions. Similarly, the presence of children older than 15 is not significant. Finally, child's age has a positive impact on the number of school meals demanded, although the effect is not significant.

Regarding socioeconomic factors, the effect of household income is positive and highly significant. As expected, a higher income is associated to an increasing number of school meals demanded. The level of education of the respondent and the area of residence have also a positive impact on the number of school meals, although this impact is not highly significant in the Poisson regression with random effects. The age of the respondent is always poorly significant. Conversely, the canton of residence in the case of Basel-City and Basel-Country has a positive impact and is significant at less than 10% in the Poisson regression with random effects. This impact is measured with respect to the reference canton of Solothurn. Finally, consider the level of satisfaction with the childcare service. This indicator is related to childcare services currently used by households when children are not at school. Satisfaction with other childcare services has a negative and highly significant impact on the number of expected school meals demanded in all the regressions. This may suggest that parents who are already satisfied with the current organization of childcare, are also likely to hold a satisfactory solution for lunches and, as a consequence, are not interested in the new school meals service. All the remaining control variables are not significant.

It is worth pointing out that possible endogeneity in employment decisions was not taken into account. The reason is that we are analyzing the hypothetical introduction of a new school meals service and, consequently, the level of employment of the household can be considered as exogenous.

[Table 5]

Using equation (5) defined in Section 2 to compute the percentage change in the expected count for a δ-unit change in one of the explanatory variables, we can interpret the impact of the coefficients of the Poisson model

with random effects. We are interested in the percentage change in the expected count for a unit change ($\delta = 1$) in the explanatory variable, holding other variables constant. In Table 5 we report the percentage change for the significant coefficients in the Poisson regression model with random effects. The percentage change in the expected count for a unit change in the price of school meals is -8.1%. This means that an increase in the price of school meals by 1 Swiss franc decreases the expected number of school meals demanded by households by 8.1%, given the other variables are held constant in the model. Since an increase in the price of school meals by 1 Swiss franc roughly represents a 10% increase in the average level of price (9.92 Swiss francs), this implies that price elasticity of demand is about 0.8, which is not far from the estimated elasticity of 0.4 found by Akin *et al.* (1983) for the demand for school meals in the US.

As for children's characteristics and family composition, if the number of additional children between 6 and 10 years and the number of additional children between 11 and 15 years increases of one unit, the demand of school meals is expected to decrease by 19.6% and 17.8%, respectively. The presence of both parents living in the household reduces the expected number of school meals by 21.7%. As for household income, an increase by one unit (that means 2000 Swiss francs) increases the expected quantity of school meals demanded by 20.2%, *ceteris paribus*. Families living in the canton Basel-Country and the canton Basel-City increase the expected number of school meals demanded by 19.6% and 22.1%, respectively, as compared to families living in canton Solothurn. Finally, parents satisfied with their current childcare mode are expected to reduce the expected number of school meals by 34.2%.

5 Willingness to pay for school meals

In Switzerland, the current pricing policy applied by the municipalities to school meals for children usually consists of a regulated price which depends on household income. From an economic point of view, this policy lacks

efficiency since cantons and municipalities do not match marginal costs and marginal benefits for meals. Although the school meal service is highly subsidized by the local government, there may be a margin to improve efficiency by taking the willingness to pay for different categories of consumers into account.

The estimation results of the Poisson model with random effects can be used to calculate the willingness to pay for school meals. This is obtained from the integral of the expected demand function. The willingness to pay for a single meal can be calculated using the following equation:

$$WTP(meals) = -\frac{1}{\beta_p}, \tag{6}$$

where β_p is the parameter corresponding to the price variable. The approach is discussed in more details, for instance, by Haab and McConnell (2002) to assess the willingness to pay for environmental and natural resources.

Using the estimated parameter β_p on the whole sample of households, we calculated that the willingness to pay for a meal is about 11.60 Swiss francs. To our knowledge, this is the first attempt to estimate the willingness to pay for school meal services. Consequently, it is not straightforward to compare our valuation with the results of other studies.

For policy discussion, we set the average cost for a meal at 25.00 Swiss francs. This corresponds to the minimum cost level calculated by the city of Lugano (in 2010), which already provides school meal services in a southern canton of Switzerland (Ticino). Further, the average price for a meal for households of medium-income class is 12.30 Swiss francs. We observe that the estimated willingness to pay for a meal is well below the full cost of the service. Nonetheless, local governments could exploit the willingness to pay for school meals and extract more surplus from households in order to reduce the deficit or to finance an increase in the supply of school meals.

From the pricing strategy point of view, it would be interesting, for instance, to use information on the willingness to pay for different income categories. To calculate the effect of price for different income categories, we can slightly modify our Poisson regression with random effects using two

approaches. The first approach interacts the price variable with a set of dummy variables representing different income categories, while the second approach introduces a new variable that represents the interaction between price and income.

[Table 6]

In Table 6 we report the results from the estimation of three different models based on the two approaches just described. We estimated these models in order to check whether the willingness to pay for a school meal varies with income. The first model (Model 1) considers the interaction between price and three income categories: below 6000 Swiss francs, between 6001 and 8000 Swiss francs, and above 8000 Swiss francs. The second model (Model 2) includes only two income categories: below and above 8000 Swiss francs. Finally, the third model (Model 3) considers the interaction between price and income. Generally, the sign and the magnitude of the coefficients do not vary across the three models, except for price and income interactions. Only the significance of the workload of the respondent differs across the models. In Model 1 and Model 2 the coefficient of *Work* is significant, whereas in Model 3 this is not significant.

The results reported in Table 6 are also similar to those of the Poisson regression with random effects reported in Table 4. The signs of the coefficients are the same. Four covariates improve their level of significance: households living in urban areas, the age of the respondent, the intensity of work (except for the third model where we interact price and income), and the level of education of the respondent. Conversely, the presence of both parents in the family is not significant anymore. Finally, the willingness to pay for a school meal does not seem to depend on household income since the interaction variables are never significant. Note, however, that the demand for school meals is significantly and positively affected by household income, which suggests that high-income families are likely to demand more meals per week and, consequently, to spend more for weekly access to school meal services.

6 Conclusions

In Switzerland, the provision of extra-familial childcare services at primary school level is lacking. To improve the provision of school meal services, the federal government has extended the program of incentives to finance childcare services before, during or after school. To be effective, policy makers need detailed information on the conditions under which parents are willing to use childcare of services.

Using a stated preferences approach, we analysed households' choices concerning the school meal service for children attending primary school in four Swiss cantons. Our results attest a significant interest for the provision of school meals in primary schools. The number of school meals demanded during a week depends mainly on the price, the household monthly income, the number of additional children between 6 and 10 years old and between 11 and 15 years old, the presence of both parents in the household, the canton of residence, and the satisfaction with the currently used childcare mode.

A growing number of parents are willing to increase their working time, especially mothers. The effect of factors considered in our models may have important implications for the enactment of a school meal service in the four cantons considered. Our results may help public authorities to understand how different factors influence households behavior, which could be taken into account to improve the supply of school meal services.

Two important aspects should be considered in designing a more efficient pricing policy for meal services. First, local governments are currently running deficits for the provision of this type of service. Second, there is a lack of supply of meal services in public schools and parents are often forced to reduce their time at work or to pay for private meal services. An improved pricing policy could then consider households willingness to pay and extract part of the current surplus to reduce the deficit of the local government and to improve the supply of meal services. Although we observe that the number of school meals demanded increases with households income, we do not find evidence that high-income families are willing to pay more than low-

income families for a school meal. This may suggest that the usual pricing policies applied in schools - i.e. setting a uniform price for school meals which varies according to household income - may not find good ground for price discrimination across income groups according to the expected benefits of school meals. Consequently, these pricing policies are likely to merely redistribute income across income categories for equity reasons.

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Variable	Description
Price	Price for the service (in Swiss francs)
Income	Household monthly income (in categories of 2000 Swiss francs: 0-2000, 2001-4000, ... , 10001-12000, above 12000)
up to 6000	Household monthly income below 6001 Swiss francs (up to 6000=1; 0 otherwise)
between 6001 and 8000	Household monthly income between 6001 and 8000 Swiss francs (between 6001 and 8000=1; 0 otherwise)
above 8000	Household monthly income above 8000 Swiss francs (above 8000=1; 0 otherwise)
Price x Income	Interaction between price and income
Care by others	The child is cared by people other than the parents (Care by others=1; 0 otherwise)
BL	The family lives in Canton Basel-Country (BL=1; 0 otherwise)
BS	The family lives in Canton Basel-City (BS=1; 0 otherwise)
AG	The family lives in Canton Aargau (AG=1; 0 otherwise)
SO	The family lives in Canton Solothurn (SO=1; 0 otherwise)
Urban	Urban region (Urban=1; 0 otherwise)
Mother	The respondent is the mother (Mother=1; 0 otherwise)
Age	Age of the respondent
Nationality	The respondent is Swiss (Nationality=1; 0 otherwise)
Work	Working rate of the respondent (in percentage)
University	The respondent has a university degree (University=1; 0 otherwise)
Satisfaction	Parents are satisfied with current childcare mode (Satisfaction=1; 0 otherwise)
Child age	Age of the child considered in the survey
Number of children	
below 3 years	Number of additional children younger than 3
between 3 and 5	Number of additional children between 3 and 5 years of age
between 6 and 10	Number of additional children between 6 and 10 years of age
between 11 and 15	Number of additional children between 11 and 15 years of age
Adults	More than two adults older than 15 (Adults=1; 0 otherwise)
Parents	Both parents live in the household (Parents=1; 0 otherwise)

Table 1: List of variables and description.

Variable	Obs.	Mean/Frequency	Std. Dev.	Min	Max
Price	1783	9.92	5.01	2.5	22.5
Socioeconomic characteristics of households					
Income	882	4.13	1.34	1	7
up to 6000	280	31.75%			
between 6001 and 8000	320	36.28%			
above 8000	282	31.97%			
Age	905	40.47	5.50	21	88
Work	902	37.53	33.37	0	100
Care by others	905	47.18%			
BL	905	25.08%			
BS	905	25.08%			
AG	905	24.97%			
SO	905	24.86%			
Urban	905	83.09%			
Mother	904	90.93%			
Nationality	905	82.98%			
University	905	13.37%			
Satisfaction	905	51.27%			
Children's characteristics and family composition					
Child age	905	9.25	2.72	5	15
Number children					
below 3	905	0.10	0.31	0	2
between 3 and 5	905	0.33	0.51	0	5
between 6 and 10	905	1.04	0.74	0	4
between 11 and 15	905	0.47	0.69	0	3
Adults	905	89.94%			
Parents	905	84.20%			

Table 2: Descriptive statistics for the household sample (N=905).

Low-income households												
	2.5 CHF		5 CHF		7.5 CHF		10 CHF		12.5 CHF		Total	
Quantity	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%
0	85	14.24	2	0.34	34	5.70	29	4.86	29	4.86	179	29.98
1	25	4.19	31	5.19	32	5.36	27	4.52	10	1.68	125	20.94
2	42	7.04	40	6.70	31	5.19	15	2.51	13	2.18	141	23.62
3	28	4.69	28	4.69	16	2.68	11	1.84	3	0.50	86	14.41
4	8	1.34	8	1.34	3	0.50	1	0.17	0	0.00	20	3.35
5	20	3.35	14	2.35	5	0.67	4	0.67	3	0.50	46	7.71
Total	208	34.84	123	20.60	121	20.27	87	14.57	58	9.72	597	100
Middle-income households												
	7.5 CHF		10 CHF		12.5 CHF		15 CHF		17.5 CHF		Total	
Quantity	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%
0	100	16.03	29	4.65	56	8.97	27	4.33	16	2.56	228	36.54
1	43	6.89	47	7.53	29	4.65	17	2.72	13	2.08	149	23.88
2	66	10.58	45	7.21	22	3.53	12	1.92	6	0.96	151	24.20
3	27	4.33	20	3.21	9	1.44	6	0.96	3	0.48	65	10.42
4	5	0.80	3	0.48	3	0.48	2	0.32	0	0.00	13	2.08
5	9	1.44	6	0.96	2	0.32	1	0.16	0	0.00	18	2.88
Total	250	40.06	150	24.04	121	19.39	65	10.42	38	6.09	624	100
High-income households												
	12.5 CHF		15 CHF		17.5 CHF		20 CHF		22.5 CHF		Total	
Quantity	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%
0	84	14.95	28	4.98	51	9.07	21	3.74	20	3.56	204	36.30
1	41	7.30	41	7.30	23	4.09	19	3.38	8	1.42	132	23.49
2	60	10.68	43	7.65	19	3.38	6	1.07	2	0.36	130	23.13
3	23	4.09	14	2.49	10	1.78	7	1.25	3	0.53	57	10.14
4	6	1.07	5	0.89	4	0.71	4	0.71	3	0.53	22	3.91
5	7	1.25	6	1.07	2	0.36	1	0.18	1	0.18	17	3.02
Total	221	24.38	137	24.38	109	19.40	58	10.32	37	6.58	562	100

Table 3: Demand for school meals by price and household income.

Variable	Poisson		Negative binomial		Poisson with RE	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Constant	0.637***	0.235	0.651**	0.258	0.644	0.404
Price	-0.045***	0.006	-0.045***	0.007	-0.085***	0.007
Income	0.084***	0.023	0.083***	0.026	0.184***	0.036
Care by others	0.037	0.047	0.035	0.052	0.120	0.080
BL	0.119*	0.064	0.113	0.069	0.179*	0.104
BS	0.230***	0.064	0.233***	0.070	0.200*	0.105
AG	0.112*	0.066	0.107	0.071	0.083	0.104
Urban	0.169**	0.073	0.167**	0.079	0.158	0.113
Mother	0.039	0.083	0.024	0.091	-0.064	0.140
Age	0.003	0.004	0.003	0.005	0.002	0.007
Nationality	-0.130**	0.053	-0.128**	0.059	-0.132	0.091
Work	0.003***	0.001	0.003***	0.001	0.002	0.001
University	0.124**	0.059	0.126**	0.065	0.141	0.104
Satisfaction	-0.281***	0.045	-0.291***	0.049	-0.418***	0.073
Child age	0.004	0.015	0.004	0.016	0.015	0.025
Number children						
below 3	-0.046	0.067	-0.042	0.073	-0.072	0.110
between 3 and 5	-0.148***	0.054	-0.148**	0.058	-0.125	0.087
between 6 and 10	-0.201***	0.039	-0.197***	0.042	-0.218***	0.062
between 11 and 15	-0.182***	0.047	-0.180***	0.051	-0.196**	0.074
Adults	-0.121	0.085	-0.111	0.095	-0.165	0.159
Parents	-0.242***	0.077	-0.243***	0.085	-0.245*	0.139
Pseudo R-squared	0.057		0.044		-	
Log-Likelihood	-2666.30		-2657.10		-2555.83	
Number of observations	1754		1754		1754	

Note: *, ** and *** denote statistical significance at 10%, 5% and 1% levels.

Table 4: Estimation results of the regression models.

Variable	Poisson with random effects (% change)
Price	-8.1
Income	20.2
BL	19.6
BS	22.1
Satisfaction	-34.2
Number children between 6 and 10	-19.6
Number chidren between 11 and 15	-17.8
Parents	-21.7

Table 5: Percentage change in the expected count.

Variable	Model 1		Model 2		Model 3	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Constant	-0.207	0.420	-0.202	0.413	-0.263	0.428
Price	-0.079***	0.009	-0.091***	0.008	-0.096***	0.017
Income	0.141***	0.048	0.139***	0.043	0.153***	0.057
Price x Income	-	-	-	-	0.002	0.004
up to 6000	-0.012	0.013	-	-	-	-
between 6001 and 8000	-0.012	0.008	-	-	-	-
above 8000	-	-	0.012	0.008	-	-
Care by others	0.084	0.076	0.083	0.076	0.084	0.076
BL	0.192*	0.100	0.192*	0.100	0.195*	0.100
BS	0.183*	0.101	0.183*	0.101	0.186*	0.101
AG	0.126	0.010	0.126	0.100	0.122	0.101
Urban	0.191*	0.109	0.192*	0.109	0.187*	0.109
Mother	-0.026	0.133	-0.025	0.133	-0.028	0.133
Age	0.013*	0.007	0.013*	0.007	0.014*	0.007
Nationality	-0.073	0.087	-0.073	0.087	-0.076	0.087
Work	0.002*	0.001	0.002*	0.001	0.002	0.001
University	0.215**	0.099	0.215**	0.099	0.217**	0.100
Satisfaction	-0.330***	0.070	-0.330***	0.070	-0.326***	0.070
Child age	0.020	0.024	0.020	0.024	0.020	0.024
Number children						
below 3 years of age	-0.037	0.106	-0.037	0.106	-0.040	0.106
between 3 and 5	-0.043	0.083	-0.043	0.083	-0.040	0.083
between 6 and 10	-0.171***	0.060	-0.171***	0.060	-0.163***	0.060
between 11 and 15	-0.192***	0.071	-0.192***	0.071	-0.188***	0.071
Adults	-0.200	0.150	-0.200	0.150	-0.199	0.150
Parents	-0.135	0.133	-0.135	0.133	-0.154	0.133
Log-Likelihood	-2514.20		-2514.20		-2515.25	
Number of observations	1754		1754		1754	

Note: * , ** and *** denote statistical significance at 10%, 5% and 1% levels.

Table 6: Estimation results of Poisson regressions with random effects.

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1998:

P. Balestra, *Efficient (and parsimonious) estimation of structural dynamic error component models*

1999:

M. Filippini, *Cost and scale efficiency in the nursing home sector : evidence from Switzerland*
L. Bernardi, *I sistemi tributari di oggi : da dove vengono e dove vanno*
L.L. Pasinetti, *Economic theory and technical progress*
G. Barone-Adesi, K. Giannopoulos, L. Vosper, *VaR without correlations for portfolios of derivative securities*
G. Barone-Adesi, Y. Kim, *Incomplete information and the closed-end fund discount*
G. Barone-Adesi, W. Allegretto, E. Dinenis, G. Sorwar, *Valuation of derivatives based on CKLS interest rate models*
M. Filippini, R. Maggi, J. Mägerle, *Skalenerträge und optimale Betriebsgrösse bei den schweizerische Privatbahnen*
E. Ronchetti, F. Trojani, *Robust inference with GMM estimators*
G.P. Torricelli, *I cambiamenti strutturali dello sviluppo urbano e regionale in Svizzera e nel Ticino sulla base dei dati dei censimenti federali delle aziende 1985, 1991 e 1995*

2000:

E. Barone, G. Barone-Adesi, R. Masera, *Requisiti patrimoniali, adeguatezza del capitale e gestione del rischio*
G. Barone-Adesi, *Does volatility pay?*
G. Barone-Adesi, Y. Kim, *Incomplete information and the closed-end fund discount*
R. Ineichen, *Dadi, astragali e gli inizi del calcolo delle probabilità*
W. Allegretto, G. Barone-Adesi, E. Dinenis, Y. Lin, G. Sorwar, *A new approach to check the free boundary of single factor interest rate put option*
G.D.Marangoni, *The Leontief Model and Economic Theory*
B. Antonioli, R, Fazioli, M. Filippini, *Il servizio di igiene urbana italiano tra concorrenza e monopolio*
L. Crivelli, M. Filippini, D. Lunati. *Dimensione ottima degli ospedali in uno Stato federale*
L. Buchli, M. Filippini, *Estimating the benefits of low flow alleviation in rivers: the case of the Ticino River*
L. Bernardi, *Fiscalità pubblica centralizzata e federale: aspetti generali e il caso italiano attuale*
M. Alderighi, R. Maggi, *Adoption and use of new information technology*
F. Rossera, *The use of log-linear models in transport economics: the problem of commuters' choice of mode*

2001:

M. Filippini, P. Prioni, *The influence of ownership on the cost of bus service provision in Switzerland. An empirical illustration*
B. Antonioli, M. Filippini, *Optimal size in the waste collection sector*
B. Schmitt, *La double charge du service de la dette extérieure*
L. Crivelli, M. Filippini, D. Lunati, *Regulation, ownership and efficiency in the Swiss nursing home industry*
S. Banfi, L. Buchli, M. Filippini, *Il valore ricreativo del fiume Ticino per i pescatori*
L. Crivelli, M. Filippini, D. Lunati, *Effizienz der Pflegeheime in der Schweiz*

2002:

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B. Antonioli, S. Banfi, M. Filippini, *La deregolamentazione del mercato elettrico svizzero e implicazioni a breve termine per l'industria idroelettrica*
M. Filippini, J. Wild, M. Kuenzle, *Using stochastic frontier analysis for the access price regulation of electricity networks*
G. Cassese, *On the structure of finitely additive martingales*

2003:

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C. Cambini, M. Filippini, *Competitive tendering and optimal size in the regional bus transportation industry*
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2004:

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2007:

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2010:

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2011:

Quaderno n. 11-01

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Quaderno n. 11-02

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Quaderno n. 11-03

L. Masiero, R. Maggi, *Accounting for WTP/WTA discrepancy in discrete choice models : discussion of policy implications based on two freight transport stated choice experiments*

Quaderno n. 11-04

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Quaderno n. 11-05

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Quaderno n. 11-07

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Quaderno n. 12-01

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Quaderno n. 12-02

M. Filippini, L.G. González Ortiz, G. Masiero, *Assessing the impact of antibiotic policies in Europe*

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L. Di Giorgio, M. Filippini, G. Masiero, *The impact of the institutional form on the cost efficiency of nursing homes*

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